Yanbu Industrial College

Department of Electrical Power Engineering Technology

EEET 103 Electrical Machines I

Lab Exercise No. 11

Title **SPEED – ARMATURE VOLTAGE CHARACTERISTICS OF SEPARATELY EXCITED DC MOTOR**

Student Name: _____ **Student ID:** _____

Submission Date: _____ **Lab Section:** _____

Important Notes

1. Every student must write Name, Section, and Lab exercise No, Title, ID Number and Submission Date clearly in provided space.
2. Only neat, clean and hand written reports on this prescribed format given in E-learning will be accepted.
3. Students are encouraged to work and study together as team work is highly recommended.
4. No credit will be given for works that are copied from any source.
5. Assignments and reports must be turned in on time.
6. Please make photocopy of your lab report before submission as original may not be returned to you.
7. In case of late submission 20% of total credits will be reduced per day.

For Instructor's use only.	
Date Received	
Maximum Marks	**10**
Late By	**days**
Deductions	**%**
Marks Obtained	
Comments (If any)	

Signature: _____

SPEED – ARMATURE VOLTAGE CHARACTERISTICS OF SEPARATELY EXCITED DC MOTOR

PERFORMANCE OBJECTIVES:

Upon completion of this laboratory experiment, the student will be able to:

- Connect and operate a Multi-function machine as separately excited DC shunt wound motor.
- Record and plot Speed-Armature Voltage curve.

EQUIPMENT:

1. DM-100 DC Machine.
2. 0-125 volt Hampden variable DC power supply, 5 amps.
3. 0-150 volt Hampden variable DC power supply, 1 amp.
4. Two Hampden DC Voltmeters.
5. Two Hampden DC Ammeters.
6. Tachometer.

DISCUSSION:

A possibility to alter the speed of a DC shunt wound motor is by the reduction of the armature voltage. The change of the terminal voltage of the armature circuit can be realized using a rheostat connected to the armature circuit (starter) as well as using a variable DC voltage.

For this the rheostat must be suitable for continuous operation below nominal load. In this fashion, the speed can basically be reduced from the nominal speed to zero. Since the excitation remains unchanged here, the motor can produce its nominal torque, however at that point the power recedes because of the reducing speed. Naturally, as the motor speed decreases, the ventilation of the motor decreases in relation to the square of the speed and the rotation of the armature is dependent on the construction of the motor-number of grooves, laminations of the commutator. These aspects could reduce the speed setting range and motor application possibilities in the range below the nominal speed.

CAUTION!

1. **High voltages are present in this experiment. Do not make any connections with the power on. The power should be turned off after completing measurement**

CIRCUIT CONNECTIONS:

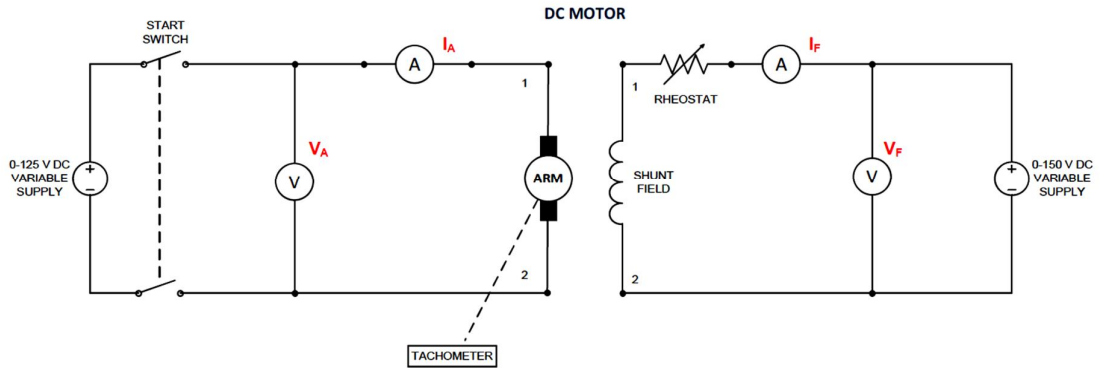


Figure 1.1

PROCEDURE:

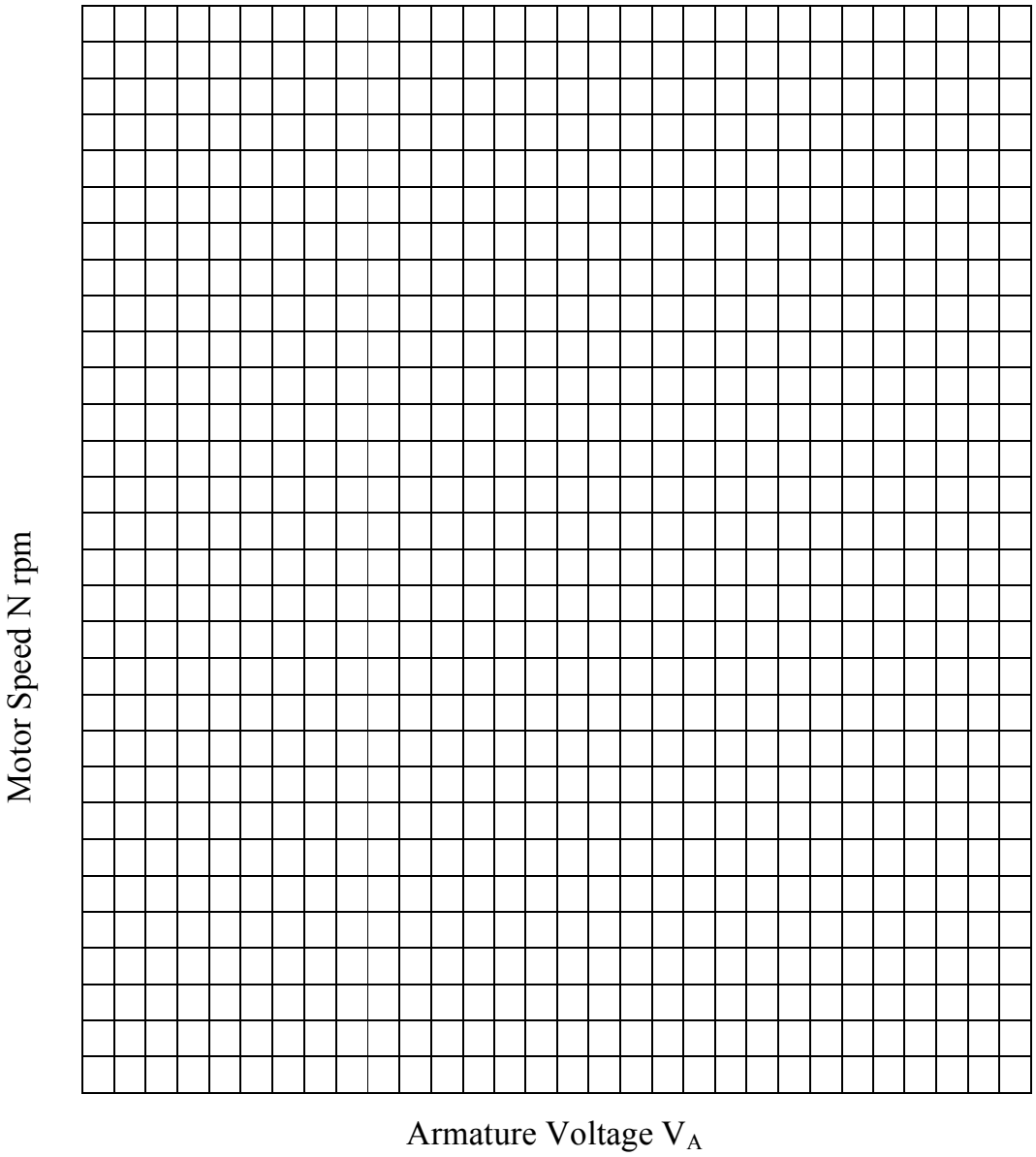
1. Make the motor connections shown in Figure 1.1 but do not turn the power ON yet.
2. Turn the knob of the 125-volt supply to zero.
3. Turn the knob of the 150-volt supply to zero.
4. Turn On the main AC circuit breaker switch and turn ON the circuit breaker switches for the two DC supplies and the DC motor.
5. Slowly increase the voltage of the 150-volt supply (energizing the field coil) until 0.4 amps flows. This establishes the main field.
6. Slowly increase the voltage of the 125-volt supply (energizing the armature coils through the brushes and commutator) until 0.4 amps flows.
7. Record Armature Current, Field current and Motor Speed in Observation Table.
8. Repeat Steps 6 and 7 for armature voltage values of 110V,90V,70V,60V,50V,40V and 30V.

OBSERVATIONS:

Armature Voltage V_A	125 V	110 V	90 V	70 V	60 V	50 V	40 V	30 V
Armature Current I_A								
Field Current I_F								
Motor Speed N rpm								

GRAPH:

Plot the Characteristics curve between **N** and V_A for Separately Excited DC Motor.



REPORT

Prepare a report containing:

1. Diagrams of each circuit.
2. All tables.
3. Graph on a grid paper.
4. All calculations and required data.
5. Answers to questions.

REVIEW QUESTIONS

1. A DC shunt motor is a:

	a	Variable-speed motor.
	b	Adjustable-speed motor.
	c	Constant-speed motor.
	d	Constant-speed-adjustable-speed motor.

2. The direction of rotation of a DC shunt motor can be reversed by interchanging

	a	The supply terminals
	b	The field terminal only.
	c	The armature terminal only.
	d	Either field or the armature terminal.

3. A DC shunt motor is runs at rated speed. If its field circuit gets open circuited, then soon after this the motor speed would tend to:

	a	Decrease
	b	Remain unchanged.
	c	Increase.
	d	Fluctuate around its previous speed.

4. A DC shunt motor is running at normal speed at rated voltage. If the supply voltage is reduce to half then its speed:

	a	Is reduced to half
	b	Remains unchanged.
	c	Increases slightly.
	d	Decreases slightly.

5. What behaviour does the DC shunt wound motor loaded at its nominal torque demonstrate when the armature voltage is reduced?

6. How the change of the armature voltage is carried out?

7. Interpret the Speed-Armature Voltage Characteristics of a DC shunt motor.

FINAL CHECKLIST

All the students must make sure, before they leave the Lab:

1. Turn the value of variable power supplies and resistive load to zero
2. Main power switch on the work bench is put "OFF".
3. All the connection of machines/ equipment is removed.
4. All machines/meters are properly placed (slide in) either in storage cabinet or in work station itself.
5. All connecting leads are sorted out according to their length and colours and placed on the hooks provided in the side of the work station.
6. Submit your answers to the questions, together with your data, calculations (if any) and results before the next laboratory sessions.